

The Pricing of Cryptocurrencies

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Cryptocurrencies VS Currency

Checklists

- Medium of Exchange
 - Unit of Account
 - Store Value
- BitCoin, LiteCoin, PeerCoin, AuroraCoin, DogeCoin and Ripple.
 - low transaction costs, high anonymity and privacy, learning spillover effects, infinite divisibility and no inflationary pressures
 - no physical representation,
 - reduce opportunities for theft, such as bank robbery
 - global currency
 - information asymmetry
 - ineffective as a tool of risk management of price volatility

- “a virtual currency is a type of unregulated, digital money, which is issued and usually controlled by its developers, and used and accepted among the members of a specific virtual community”
- a digital representation of value that is neither issued by a central bank or public authority nor necessarily attached to a [conventional currency], but is used by natural or legal persons as a means of exchange and can be transferred, stored or traded electronically
- Medium of exchange : Transaction costs, Anonymity and transparency, Network externalities, Credit market
- Unit of account : Divisibility, Price volatility
- Store of value : Non-inflationary supply, Cyber security

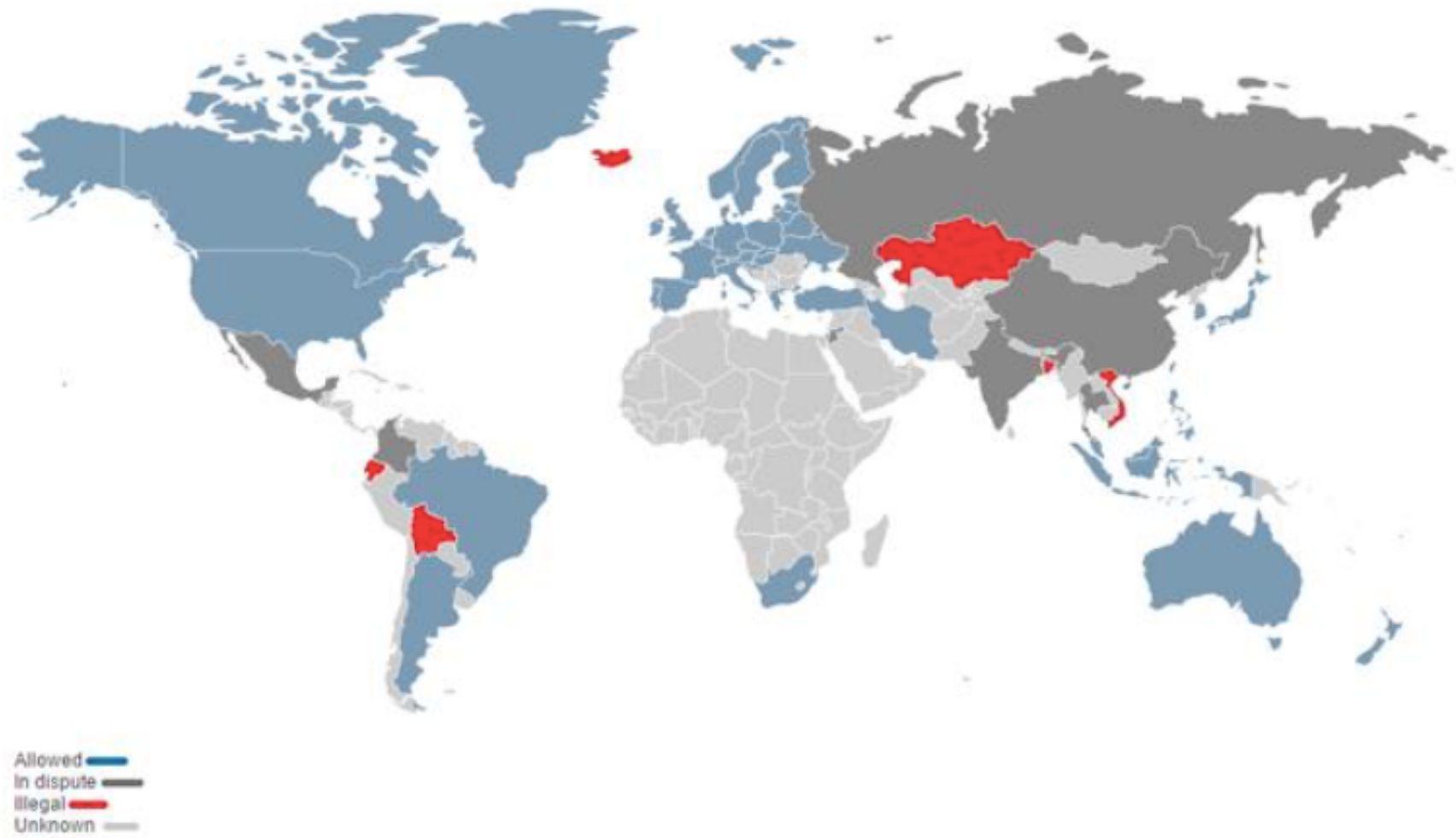
Basic Knowledge about BitCoins

- Digital Currencies or Cryptocurrencies
- A **peer-to-peer payment system** created in 2009 by programmer Satoshi Nakamoto
- First open source digital currency
- The quantity of units in circulation **is not controlled by a person, group, company, central authority, or government**, but a **software algorithm** controls the amount of BitCoins issued.
- A fixed amount of BitCoins is issued at a **fixed a-priori defined and publicly known rate**, implying that the stock of BitCoins **increases at a decreasing rate**.
- BitCoin is developed outside of an underlying economy or issuing institution, implying that there are **no macroeconomic fundamentals** that would determine its price formation (BitCoin is a fiat currency without an intrinsic value)
- BitCoin **growth rate will converge to zero (At 2140)**, the **maximum stock of BitCoins (21 million units)** will not change after 2140

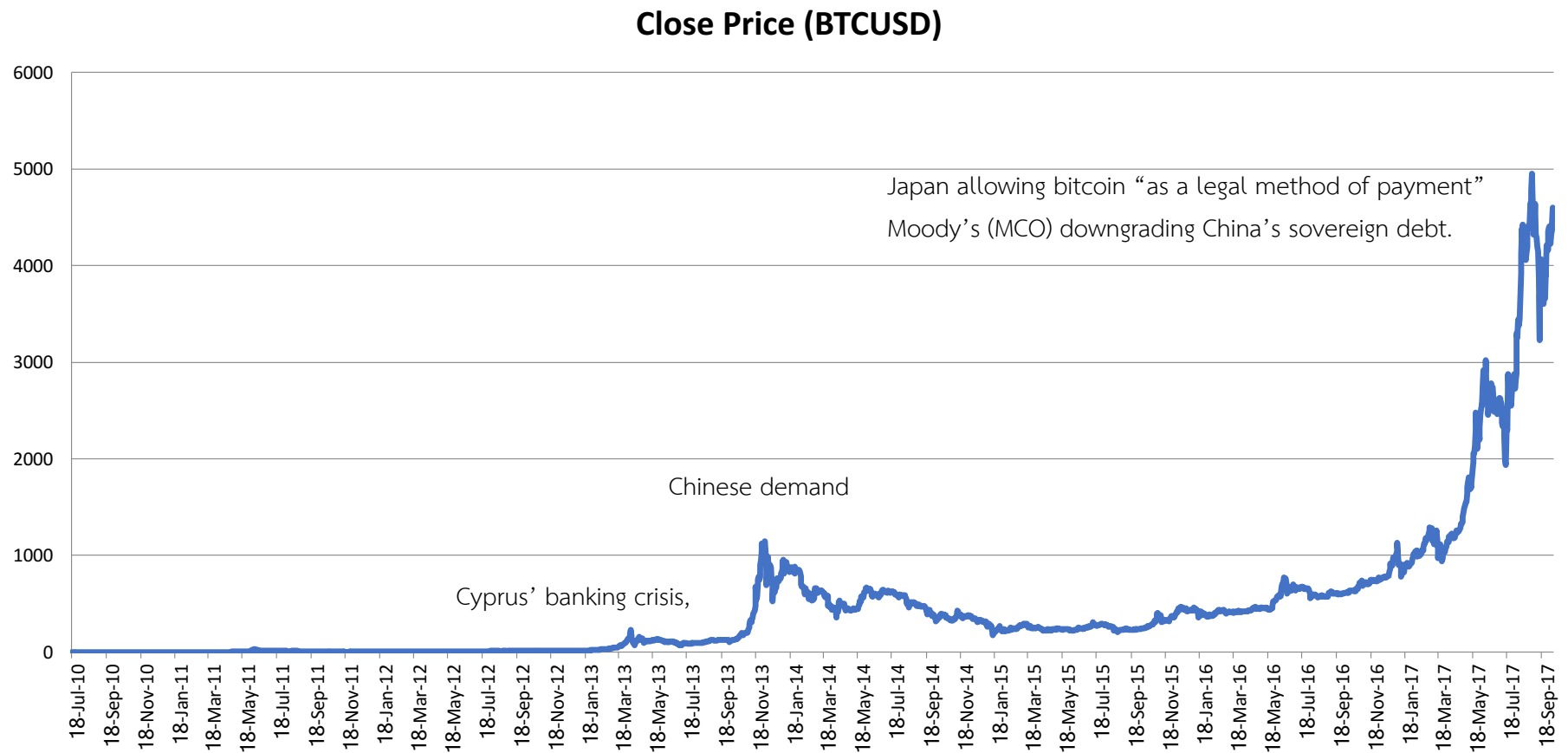
Features

- The exchange rate for Bitcoin to fiat currencies floats and is determined by supply and demand; there is no governmental authority or company making guarantees about its value.
- Bitcoin is not backed by governments and also has no fundamental value has created confusion in the popular discussion about how exchange rates are determined.
- Bitcoin exchange rates can (in a very stylized model) be fully determined by two market fundamentals: the steady state transaction volume of Bitcoin when used for payments, and the evolution of beliefs about the likelihood that the technology survives.
- Bitcoin Wallet and Transaction Cost

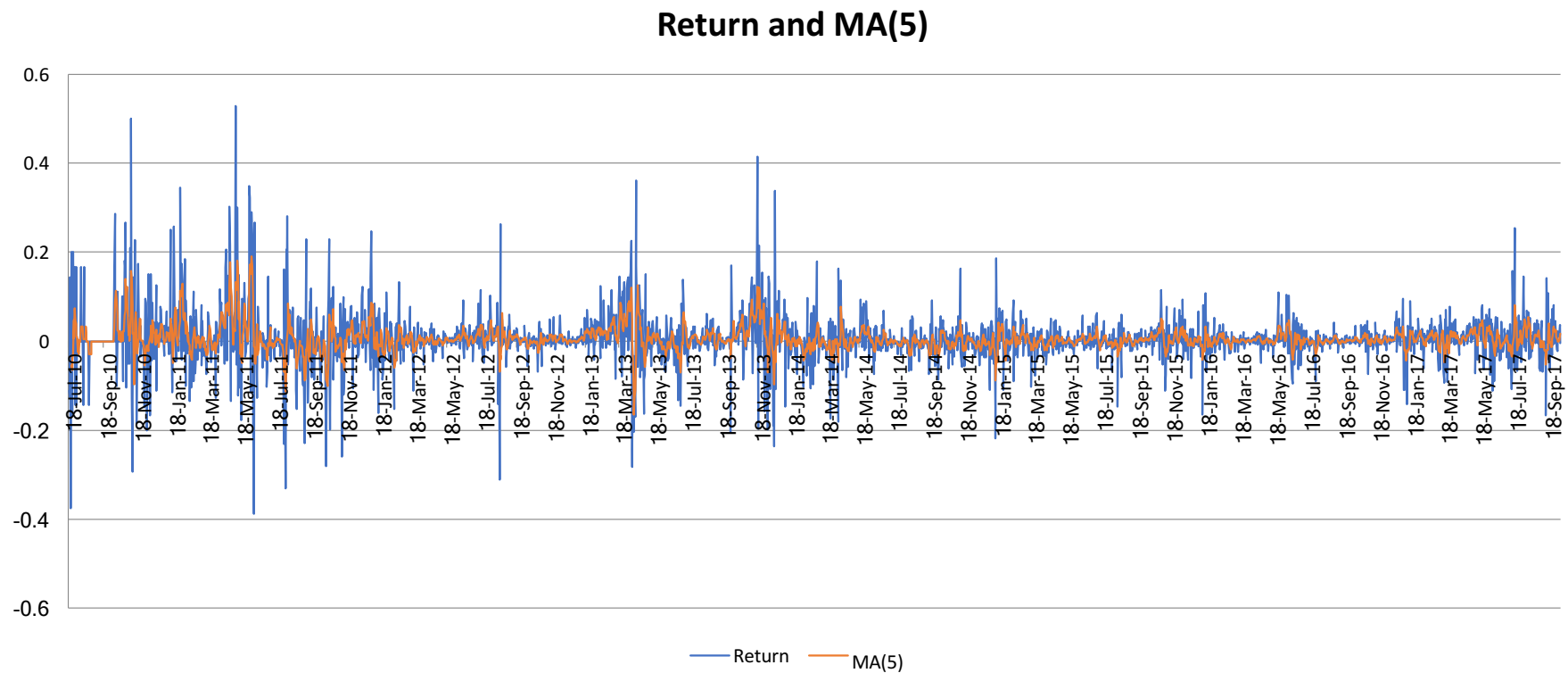
Legally Used



Bitcoin Price



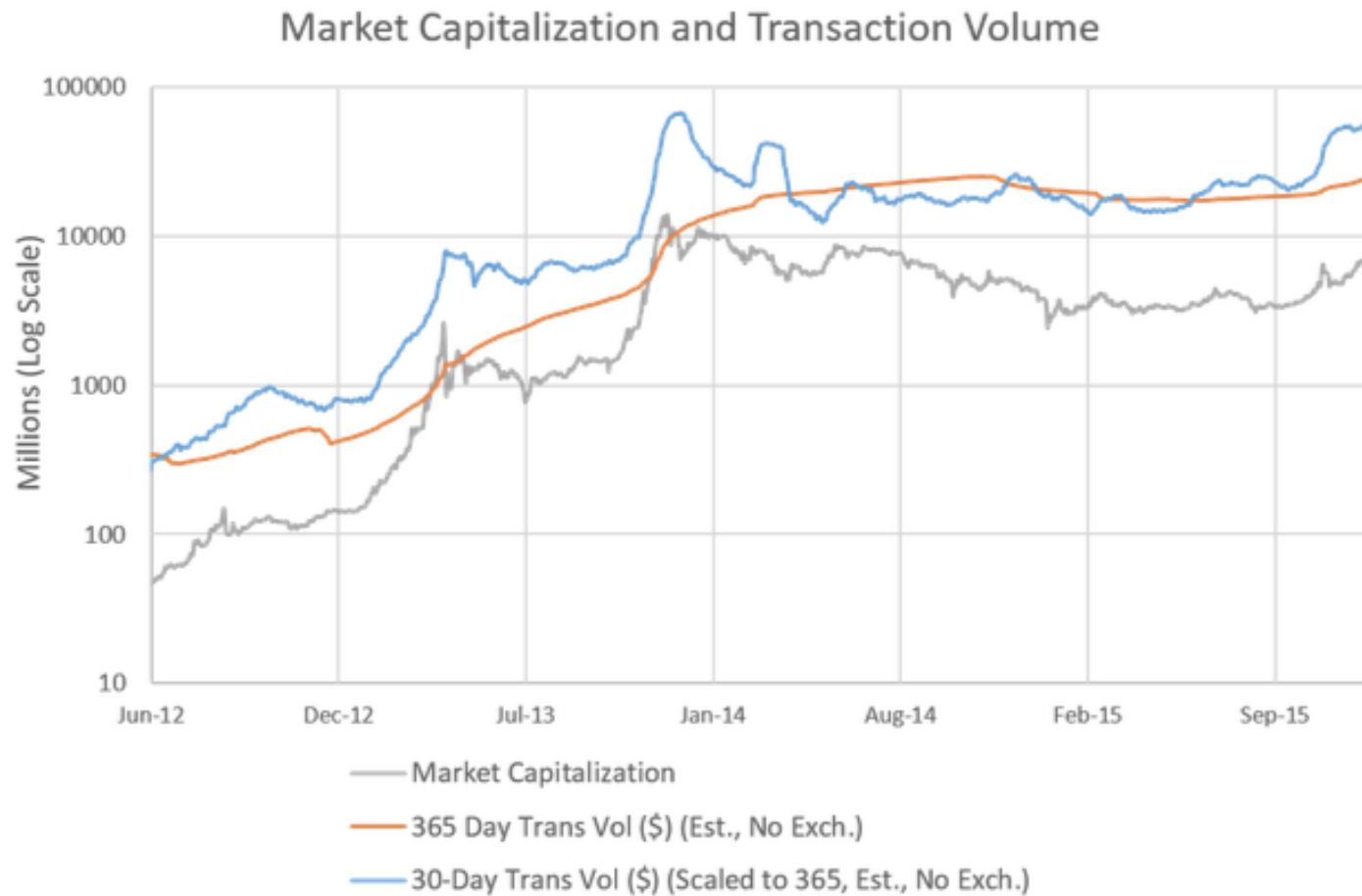
Bitcoin Return



Factors Affecting BitCoins

- Market fundamentals: Demand (medium of exchange) and Supply (amount of units in circulation and thus its scarcity on the market) (Buchholz et al. 2012)
- Attractiveness for investors (no central bank and no interest for Bitcoins) (Kristoufek 2013)
- Development of global financial indicators (van Wijk 2013)
- At 2140 the BitCoin growth rate will converge to zero, the maximum stock of BitCoins (21 million units) will not change after 2140
- To buy goods or services worldwide, provided that transaction partners accept BitCoin as a mean of payment

Market Cap and Volume



Pricing Cryptocurrencies

- The first examines the relationship between transaction volume and exchange rates over time, showing that exchange rates generally follow a pattern consistent with fundamentals outside a few (non-trivial) periods of price spikes.
- Thus, at least directionally, the forces of supply and demand appear to be operating.
individual behavior on Bitcoin to understand how Bitcoin is being used (in particular, whether for investment or for payments).
- Use of Bitcoin to buy illegal substances such as drugs and firearms

Adoption and Usage

- Bitcoin Pricing, Adoption and Usage: Theory and Evidence (2016)
- Set of theoretical model:
- In the absence of investors, if all agents eventually adopt Bitcoin, then there is a unique equilibrium exchange rate in each period, which is determined by supply and demand (economic fundamentals).
- The steady state expected exchange rate for Bitcoin is equal to **the ratio of the expected transaction volume and the supply of Bitcoins**.
- Transaction volume in turn depends the advantages of Bitcoin relative to other payment options.

Adoption and Usage

- Bitcoin utilization starts out lower when agents are more risk averse.
- Investors may buy Bitcoin, which decreases the effective supply for users and increases the market equilibrium price.
- If an investor exogenously bought a certain quantity of Bitcoins and held them (or alternatively, if some were lost), the exchange rate would adjust in proportion to the number taken out of the market.

Adoption and Usage : From Theory to Empirics

- How tightly correlated are prices and transaction volume for Bitcoin? Is price directly proportional to transaction volume divided by the number of Bitcoins?
- What share of Bitcoin activity appears to be about using Bitcoin as a store of value, versus international payments or e-commerce?
- What use cases appear to be prevalent among commercial uses? Is illicit activity important, and do users appear to protect their financial privacy?

Exchange Rate

- Exchange Rate = (Transaction Volume) / (Velocity x Supply of Bitcoins)
- the exchange rate is the ratio of the demand (transaction volume) and the effective supply of Bitcoin.
- Other factors that might affect the velocity :
 - the share of users that are actively using Bitcoin
 - the share of Bitcoins that have been lost (e.g. the passcode or wallet is lost)
 - the opportunities to use Bitcoin commercially (e.g. merchant acceptance),
 - the availability of convenient applications, e.g. on mobile platforms.

Demand and Supply

- The demand for BitCoin is primarily driven by its value as a medium of exchange (i.e. by value in future exchange)
- Assume that firms need to convert BitCoins into dollars or other currencies, as they operate in economies using dollars or other currencies for purchase production factors
- The supply is given by the stock of BitCoins in circulation, which is publicly known and is predefined in the long run.
- Barro's (1979) model for gold standard

$$\left. \begin{array}{l} M^S = P^B B \\ M^D = \frac{PY}{V} \end{array} \right\} \quad \begin{array}{l} P^B = \frac{PY}{VB} \\ p_t^B = \beta_0 + \beta_1 p_t + \beta_2 y_t + \beta_3 v_t + \beta_4 b_t + \varepsilon_t \end{array}$$

BitCoin's attractiveness for investors

- BitCoin price may be affected by risk and uncertainty of the BitCoin system (Greco 2001).
- BitCoin is more vulnerable to cyber-attacks, more volatile price responses (Barber et al. 2012; Moore and Christin 2013)
- BitCoin's price is also determined by transactions costs for potential investors
- **Adding term** BitCoin's attractiveness for investors

$$p_t^B = \beta_0 + \beta_1 p_t + \beta_2 y_t + \beta_3 v_t + \beta_4 b_t + \beta_5 a_t + \varepsilon_t$$

Macroeconomic and financial developments

- global macroeconomic and financial development, stock exchange indices, exchange rates, and oil prices measures in determining BitCoin price (Van Wijk; 2013)
- **Adding term** mt is captures macroeconomic and financial indicators

$$p_t^B = \beta_0 + \beta_1 p_t + \beta_2 y_t + \beta_3 v_t + \beta_4 b_t + \beta_5 a_t + \beta_6 m_t + \varepsilon_t$$

Econometrics Approach

- Method: Engle and Granger (1987),

$$Z_t = A_1 Z_{t-1} + \dots + A_k Z_{t-k} + \varepsilon_t$$

$$\Delta Z_t = \sum_{i=1}^{k-1} \Gamma_i \Delta Z_{t-i} + \Pi Z_{t-1} + \varepsilon_t$$

Supply-demand variables	number of BitCoins number of transactions number of addresses days destroyed exchange rate
Bitcoin attractiveness	views on Wikipedia new members new posts
Macro-financial developments	Dow Jones oil price

Be Careful: Dangerous Pricing Game (Aswath Damodaran, 2017)

- "If you don't believe that bitcoin will ever acquire wide acceptance in transactions, it is time that you were honest with yourself and recognized that is just a lucrative, but dangerous, pricing game with no good ending,"
- "The disparity between virtually no merchant acceptance and Bitcoin's rapid appreciation is striking." (Morgan Stanley, 2012)
- Part of the reason why few customers and merchants use bitcoin is high transaction cost. Fees have climbed as an increasing number of transactions, which includes investment and trading-related activity, compete for limited processing power on the bitcoin network.
- The average bitcoin transaction fee jumped from around 31 cents in December to a high of \$5.50 in June and was still near \$2 this week, according to BitInfoCharts.
- The "most enduring part" of this digital currency phase may be the blockchain technology they use, he said, "not the currencies themselves."